US011381879B2

(12) **United States Patent**
Sim et al.

(10) **Patent No.: US 11,381,879 B2**
(45) **Date of Patent: Jul. 5, 2022**

(54) **VOICE RECOGNITION SYSTEM, VOICE RECOGNITION SERVER AND CONTROL METHOD OF DISPLAY APPARATUS FOR PROVIDING VOICE RECOGNITION FUNCTION BASED ON USAGE STATUS**

(71) Applicant: **SAMSUNG ELECTRONICS CO., LTD.**, Suwon-si (KR)

(72) Inventors: **Jeong-min Sim**, Suwon-si (KR); **Do-wan Kim**, Gunpo-si (KR)

(73) Assignee: **SAMSUNG ELECTRONICS CO., LTD.**, Suwon-si (KR)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **16/742,577**

(22) Filed: **Jan. 14, 2020**

(65) **Prior Publication Data**

US 2020/0154171 A1 May 14, 2020

Related U.S. Application Data

(63) Continuation of application No. 14/311,972, filed on Jun. 23, 2014, now Pat. No. 10,555,041.

(30) **Foreign Application Priority Data**

Nov. 12, 2013 (KR) 10-2013-0136983

(51) **Int. Cl.**
G10L 15/00 (2013.01)
H04N 21/47 (2011.01)
(Continued)

(52) **U.S. Cl.**
CPC ***H04N 21/47*** (2013.01); ***G10L 15/22*** (2013.01); ***H04N 5/60*** (2013.01);
(Continued)

(58) **Field of Classification Search**
CPC combination set(s) only.
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

6,762,692 B1 * 7/2004 Mingot G10L 15/22 340/12.54
9,262,405 B1 2/2016 Baliga
(Continued)

FOREIGN PATENT DOCUMENTS

JP 2002-041276 A 2/2002
KR 1993-0015797 A 7/1993
(Continued)

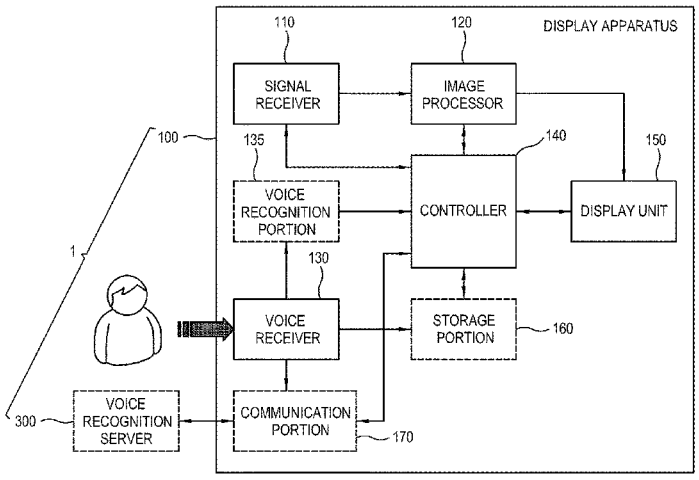
OTHER PUBLICATIONS

Communication dated Jul. 10, 2019, issued by the United States Patent Office in parent U.S. Appl. No. 14/311,972.
(Continued)

Primary Examiner — Vu B Hang
(74) *Attorney, Agent, or Firm* — Sughrue Mion, PLLC

(57) **ABSTRACT**

Apparatuses and methods related to a voice recognition system, a voice recognition server and a control method of a display apparatus, are provided. More particularly, apparatuses and methods relate to a voice recognition system which performs a voice recognition function by using at least one of a current usage status with respect to the display apparatus and a function that is currently performed by the display apparatus. A voice recognition system includes: a voice receiver which receives a voice command; and a controller which determines at least one from among a current usage status with respect to a display apparatus and a function currently performed by the display apparatus, determines an operation corresponding to the received voice command by using at least one from among the determined current usage status and the function currently performed by
(Continued)



the display apparatus, and performs the determined operation.

13 Claims, 10 Drawing Sheets

(51) **Int. Cl.**

G10L 15/22	(2006.01)
H04N 21/422	(2011.01)
H04N 5/60	(2006.01)
G10L 15/08	(2006.01)
G10L 15/18	(2013.01)
G10L 15/183	(2013.01)
H04N 5/445	(2011.01)
G10L 15/30	(2013.01)

(52) **U.S. Cl.**

CPC ***H04N 21/42203*** (2013.01); *G10L 15/08* (2013.01); *G10L 15/183* (2013.01); *G10L 15/1822* (2013.01); *G10L 15/30* (2013.01); *G10L 2015/228* (2013.01); *H04N 5/445* (2013.01); *H04N 21/42222* (2013.01)

(56) **References Cited**

U.S. PATENT DOCUMENTS

2006/0041926	A1*	2/2006	Istvan	H04N 5/4403 725/133
2008/0021598	A1	1/2008	Daude	
2008/0154606	A1	6/2008	Lee	
2008/0221898	A1	9/2008	Cerra	
2010/0312547	A1	12/2010	Van Os	
2011/0022388	A1	1/2011	Wu	
2011/0313775	A1	12/2011	Laligand	
2013/0073293	A1*	3/2013	Jang	G10L 15/22 704/275
2014/0052450	A1*	2/2014	Cheong	H04N 21/4622 704/275
2014/0052451	A1*	2/2014	Cheong	H04N 21/4821 704/275

FOREIGN PATENT DOCUMENTS

KR	10-2000-0034586	A	6/2000
KR	2003-0051368	A	6/2003
KR	10-2004-0107232	A	12/2004
KR	10-2012-0083025	A	7/2012
KR	10-2013-0068303	A	6/2013

OTHER PUBLICATIONS

Communication dated Dec. 31, 2018, issued by the United States Patent Office in parent U.S. Appl. No. 14/311,972.
Communication dated Sep. 20, 2018, issued by the United States Patent Office in parent U.S. Appl. No. 14/311,972.
Communication dated Apr. 19, 2018, issued by the United States Patent Office in parent U.S. Appl. No. 14/311,972.
Communication dated Jan. 2, 2018, issued by the United States Patent Office in parent U.S. Appl. No. 14/311,972.
Communication dated Jun. 15, 2017, issued by the United States Patent Office in parent U.S. Appl. No. 14/311,972.
Communication dated Feb. 28, 2017, issued by the United States Patent Office in parent U.S. Appl. No. 14/311,972.
Communication dated Jun. 30, 2016, issued by the United States Patent Office in parent U.S. Appl. No. 14/311,972.
Communication dated Mar. 10, 2016, issued by the United States Patent Office in parent U.S. Appl. No. 14/311,972.
Communication dated Aug. 27, 2015, issued by the United States Patent Office in parent U.S. Appl. No. 14/311,972.
Communication dated Apr. 10, 2020 issued by the Korean Intellectual Property Office in counterpart English Korean Application No. 10-2013-0136983.
Communication dated Dec. 8, 2020, issued by the Korean Intellectual Property Office in corresponding Korean Application No. 10-2013-0136983.
Communication dated Oct. 27, 2020, issued by the Korean Intellectual Property Office in corresponding Korean Application No. 10-2013-0136983.
Communication dated May 28, 2021, issued by the Korean Intellectual Property Office in Korean Application No. 10-2021-0030116.
KR Office Action dated Nov. 29, 2021, issued by Korean Intellectual Property Office in 10-2021-0030116.

* cited by examiner

FIG. 1

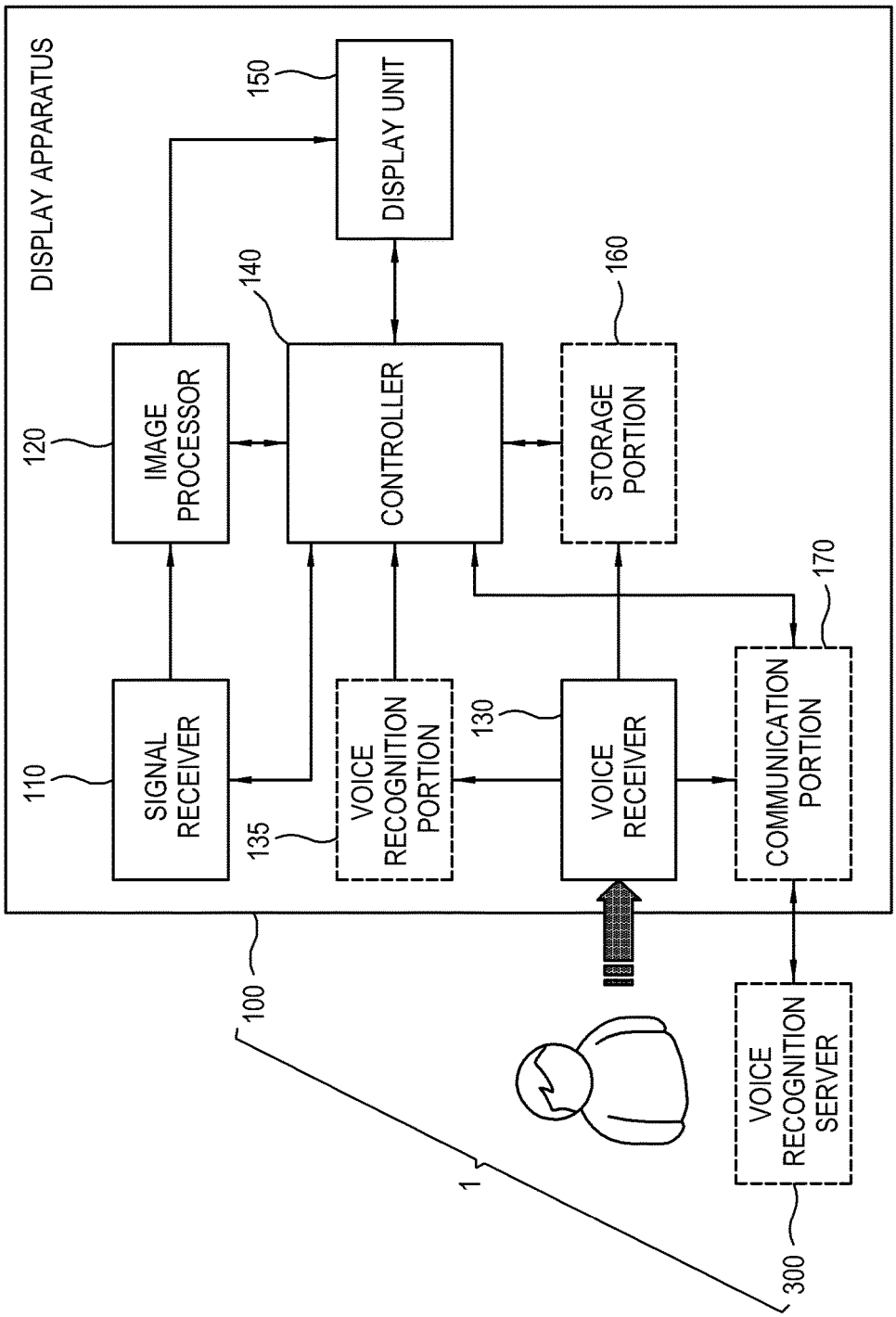

DISPLAY APPARATUS
100
150
DISPLAY UNIT
140
160
120
IMAGE PROCESSOR
CONTROLLER
STORAGE PORTION
170
110
SIGNAL RECEIVER
135
VOICE RECOGNITION PORTION
130
VOICE RECEIVER
COMMUNICATION PORTION
1
VOICE RECOGNITION SERVER
300

FIG. 2

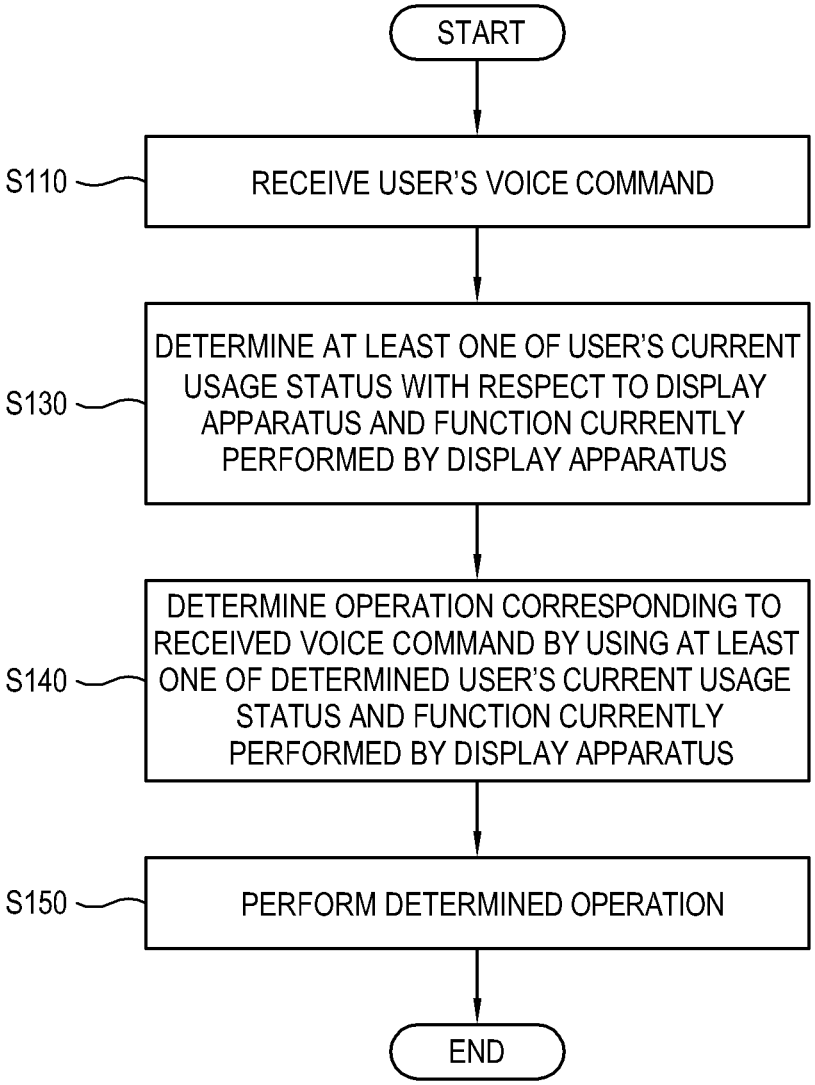

START
S110
RECEIVE USER'S VOICE COMMAND
S130
DETERMINE AT LEAST ONE OF USER'S CURRENT USAGE STATUS WITH RESPECT TO DISPLAY APPARATUS AND FUNCTION CURRENTLY PERFORMED BY DISPLAY APPARATUS
S140
DETERMINE OPERATION CORRESPONDING TO RECEIVED VOICE COMMAND BY USING AT LEAST ONE OF DETERMINED USER'S CURRENT USAGE STATUS AND FUNCTION CURRENTLY PERFORMED BY DISPLAY APPARATUS
S150
PERFORM DETERMINED OPERATION
END

FIG. 3

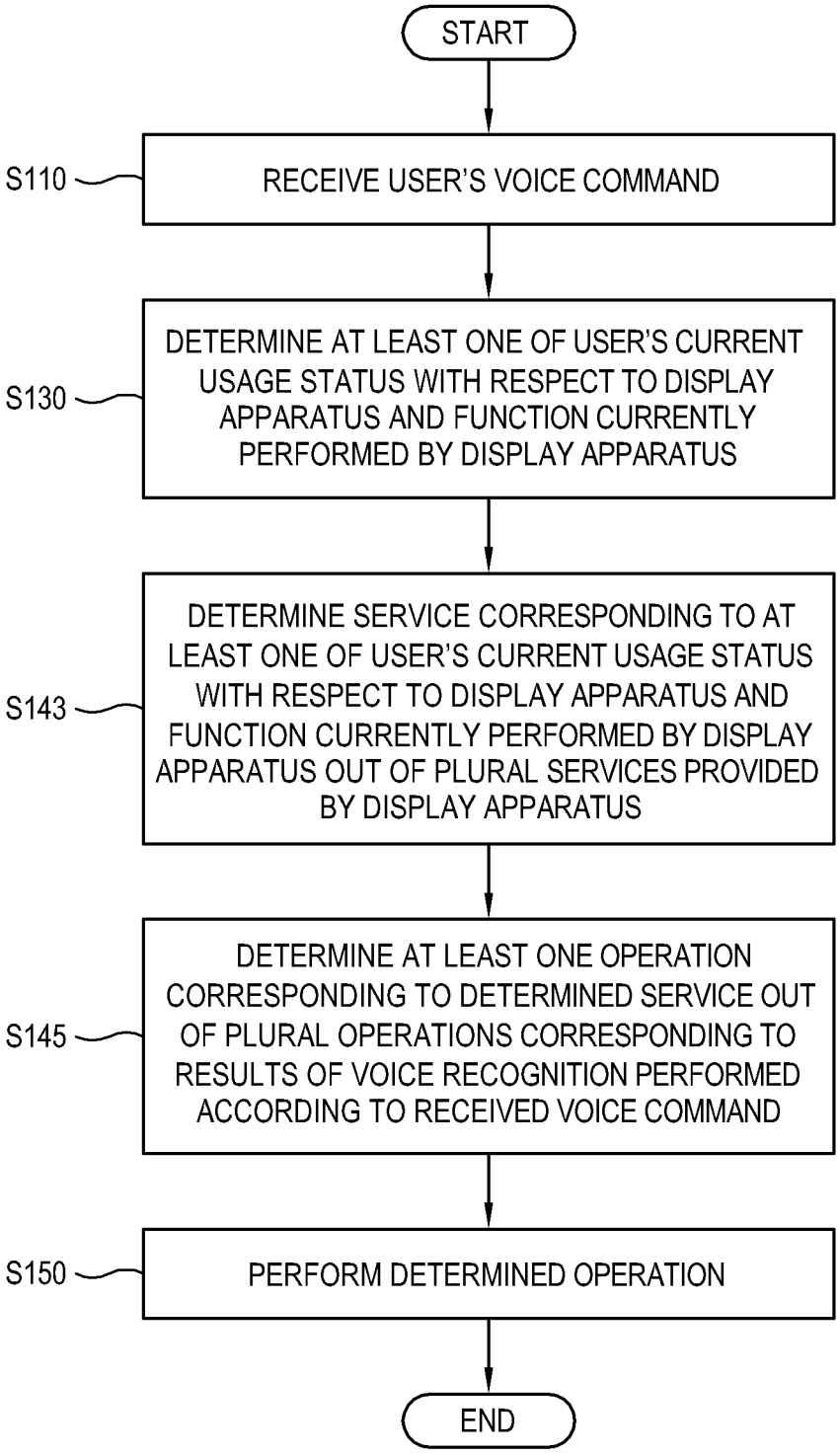

START
S110
RECEIVE USER'S VOICE COMMAND
S130
DETERMINE AT LEAST ONE OF USER'S CURRENT USAGE STATUS WITH RESPECT TO DISPLAY APPARATUS AND FUNCTION CURRENTLY PERFORMED BY DISPLAY APPARATUS
S143
DETERMINE SERVICE CORRESPONDING TO AT LEAST ONE OF USER'S CURRENT USAGE STATUS WITH RESPECT TO DISPLAY APPARATUS AND FUNCTION CURRENTLY PERFORMED BY DISPLAY APPARATUS OUT OF PLURAL SERVICES PROVIDED BY DISPLAY APPARATUS
S145
DETERMINE AT LEAST ONE OPERATION CORRESPONDING TO DETERMINED SERVICE OUT OF PLURAL OPERATIONS CORRESPONDING TO RESULTS OF VOICE RECOGNITION PERFORMED ACCORDING TO RECEIVED VOICE COMMAND
S150
PERFORM DETERMINED OPERATION
END

FIG. 4

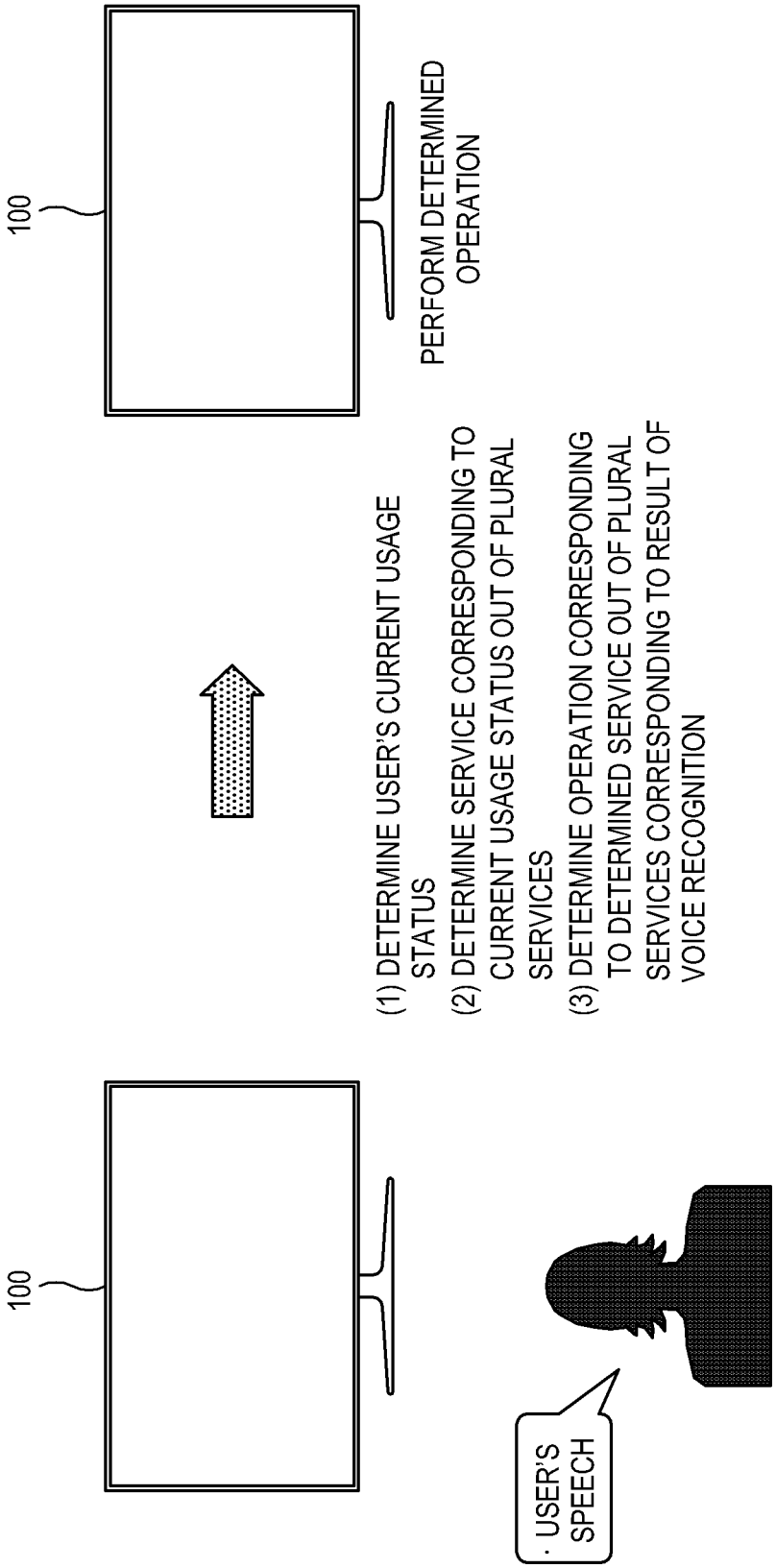

100
100
PERFORM DETERMINED OPERATION
(1) DETERMINE USER'S CURRENT USAGE STATUS
(2) DETERMINE SERVICE CORRESPONDING TO CURRENT USAGE STATUS OUT OF PLURAL SERVICES
(3) DETERMINE OPERATION CORRESPONDING TO DETERMINED SERVICE OUT OF PLURAL SERVICES CORRESPONDING TO RESULT OF VOICE RECOGNITION
USER'S SPEECH

FIG. 5

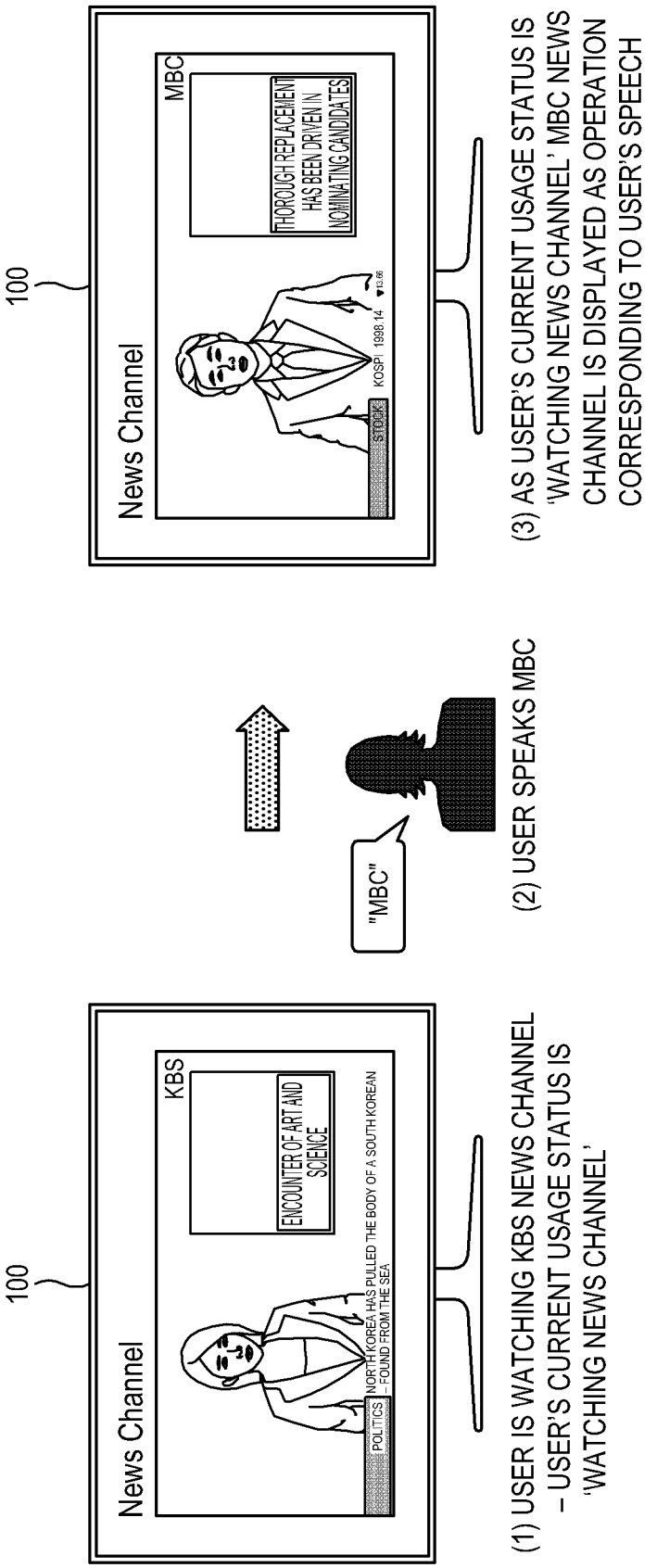

100
News Channel
KBS
ENCOUNTER OF ART AND SCIENCE
POLITICS
NORTH KOREA HAS PULLED THE BODY OF A SOUTH KOREAN FOUND FROM THE SEA
(1) USER IS WATCHING KBS NEWS CHANNEL – USER'S CURRENT USAGE STATUS IS 'WATCHING NEWS CHANNEL'
"MBC"
(2) USER SPEAKS MBC
100
News Channel
MBC
THOROUGH REPLACEMENT HAS BEEN DRIVEN IN NOMINATING CANDIDATES
STOCK
KOSPI 1998.14
(3) AS USER'S CURRENT USAGE STATUS IS 'WATCHING NEWS CHANNEL' MBC NEWS CHANNEL IS DISPLAYED AS OPERATION CORRESPONDING TO USER'S SPEECH

FIG. 6

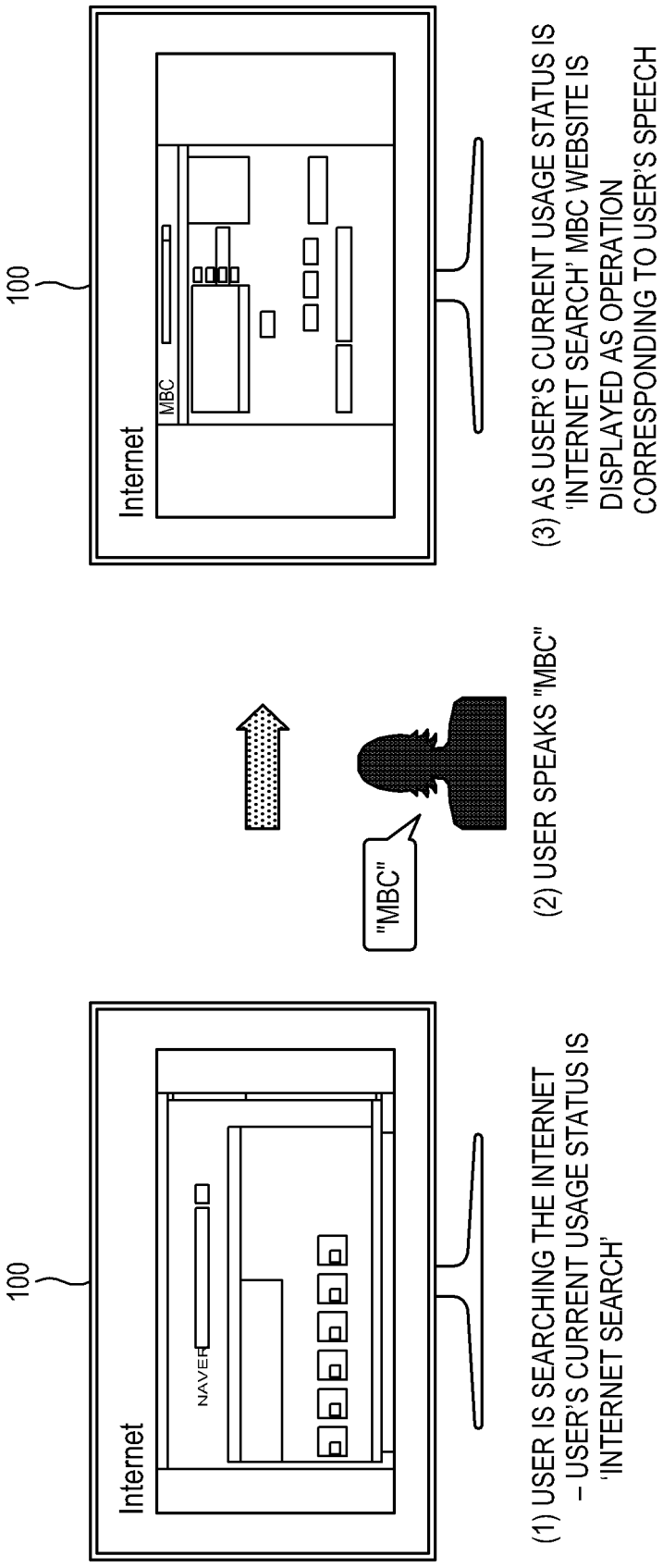

100
Internet
NAVER
(1) USER IS SEARCHING THE INTERNET
– USER'S CURRENT USAGE STATUS IS
'INTERNET SEARCH'
"MBC"
(2) USER SPEAKS "MBC"
100
Internet
MBC
(3) AS USER'S CURRENT USAGE STATUS IS
'INTERNET SEARCH' MBC WEBSITE IS
DISPLAYED AS OPERATION
CORRESPONDING TO USER'S SPEECH

FIG. 7

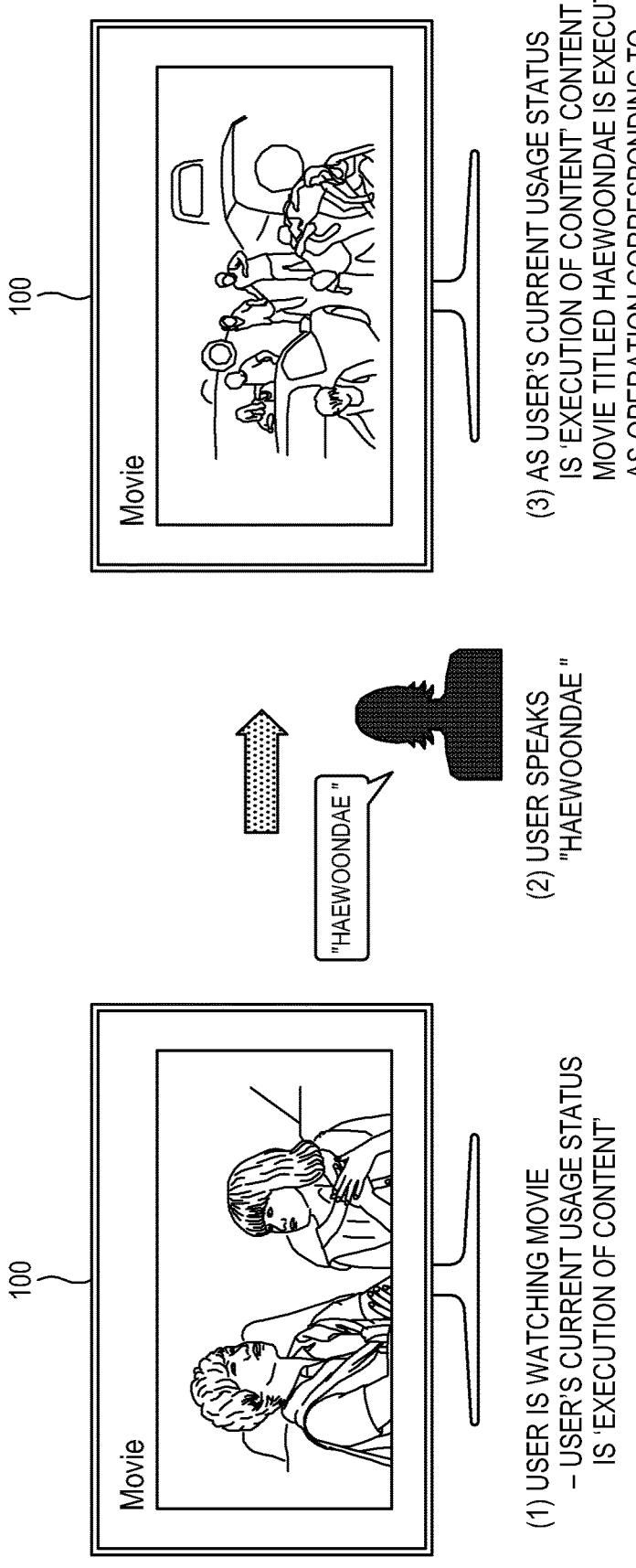

100
Movie
(1) USER IS WATCHING MOVIE
– USER'S CURRENT USAGE STATUS
IS 'EXECUTION OF CONTENT'
"HAEWOONDAE"
(2) USER SPEAKS
"HAEWOONDAE"
100
Movie
(3) AS USER'S CURRENT USAGE STATUS
IS 'EXECUTION OF CONTENT' CONTENT OF
MOVIE TITLED HAEWOONDAE IS EXECUTED
AS OPERATION CORRESPONDING TO
USER'S SPEECH

FIG. 8

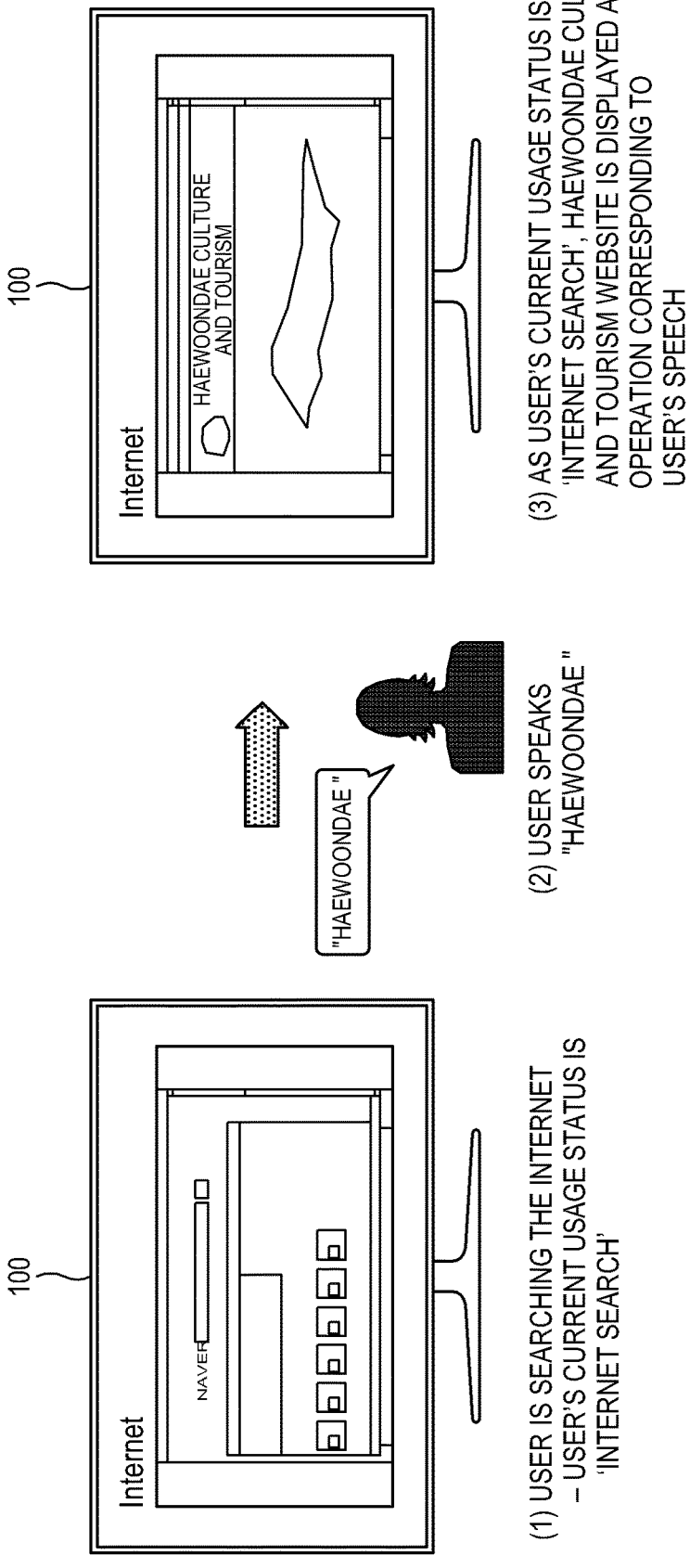

100
Internet
NAVER
(1) USER IS SEARCHING THE INTERNET
– USER'S CURRENT USAGE STATUS IS
'INTERNET SEARCH'
"HAEWOONDAE"
(2) USER SPEAKS
"HAEWOONDAE"
100
Internet
HAEWOONDAE CULTURE AND TOURISM
(3) AS USER'S CURRENT USAGE STATUS IS
'INTERNET SEARCH', HAEWOONDAE CULTURE
AND TOURISM WEBSITE IS DISPLAYED AS
OPERATION CORRESPONDING TO
USER'S SPEECH

FIG. 9

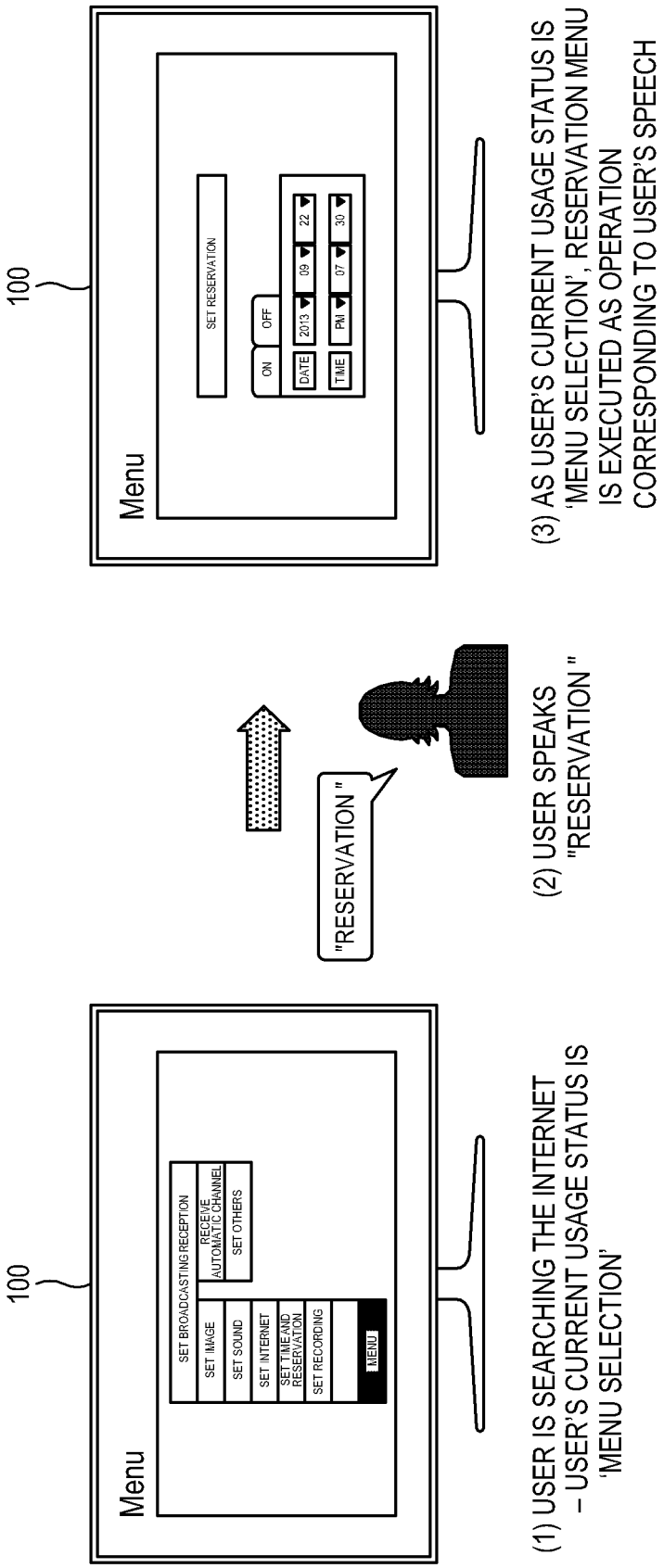
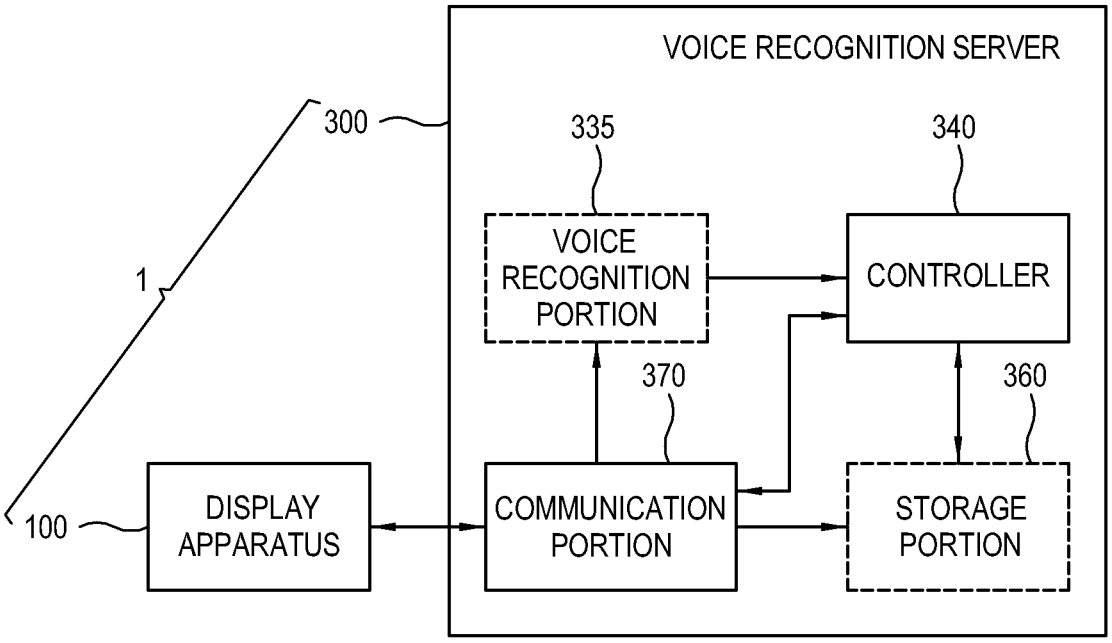

100
Menu
SET BROADCASTING RECEPTION
SET IMAGE
SET SOUND
SET INTERNET
SET TIME AND RESERVATION
SET RECORDING
MENU
RECEIVE AUTOMATIC CHANNEL
SET OTHERS
(1) USER IS SEARCHING THE INTERNET – USER'S CURRENT USAGE STATUS IS 'MENU SELECTION'
"RESERVATION "
(2) USER SPEAKS "RESERVATION "
100
Menu
SET RESERVATION
ON
OFF
DATE
2013
09
22
TIME
PM
07
30
(3) AS USER'S CURRENT USAGE STATUS IS 'MENU SELECTION', RESERVATION MENU IS EXECUTED AS OPERATION CORRESPONDING TO USER'S SPEECH

FIG. 10


VOICE RECOGNITION SERVER
300
335
340
1
VOICE RECOGNITION PORTION
CONTROLLER
370
360
100
DISPLAY APPARATUS
COMMUNICATION PORTION
STORAGE PORTION

VOICE RECOGNITION SYSTEM, VOICE RECOGNITION SERVER AND CONTROL METHOD OF DISPLAY APPARATUS FOR PROVIDING VOICE RECOGNITION FUNCTION BASED ON USAGE STATUS

CROSS-REFERENCE TO RELATED APPLICATION

This application is a Continuation Application of U.S. patent application Ser. No. 14/311,972, filed on Jun. 23, 2014, which claims priority from Korean Patent Application No. 10-2013-0136983, filed on Nov. 12, 2013 in the Korean Intellectual Property Office, the disclosure of which is incorporated herein by reference in its entirety.

BACKGROUND

Field

Systems, apparatuses and methods consistent with the exemplary embodiments relate to a voice recognition system, a voice recognition server and a control method of a display apparatus, and more particularly, to a voice recognition system, a voice recognition server and a control method of a display apparatus which performs a voice recognition function based on analysis of a current usage status of a user with respect to the display apparatus.

Description of the Related Art

Voice recognition technology is used to recognize a voice signal that has been obtained by collecting a voice input by a user, etc., as a signal corresponding to a predetermined language and may be used in various fields. In particular, an electronic apparatus such as a television (TV) or a mobile phone is provided with voice recognition functions that are performed via a microphone in addition to an existing input method using a remote controller. For example, a channel of a TV may be controlled by speaking a particular command such as "channel up", and then by recognizing a user's voice signal through a voice recognition engine of the TV.

In performing the voice recognition function through a user's speech, there arises no problem if the user's speech matches a function to be performed. However, if there are two or more functions that correspond to a user's speech and one of the functions is performed randomly, a user may be inconvenienced due to the performance of an unintended operation.

SUMMARY

Accordingly, one or more exemplary embodiments provide a voice recognition system, a voice recognition server and a control method of a display apparatus which ensures reliability and convenience in performing a voice recognition function as intended by a user by using at least one of a current usage status of a user with respect to the display apparatus and a function that is currently performed by the display apparatus.

According to an aspect of an exemplary embodiment, there is provided a control method of a display apparatus including: receiving a voice command of a user; determining at least one from among a current usage status with respect to the display apparatus and a function that is currently performed by the display apparatus; determining an operation corresponding to the received voice command by using at least one from among the determined current usage status and the function currently performed by the display apparatus; and performing the determined operation.

The determining the operation may include determining the operation corresponding to at least one from among the user's current usage status and the function currently performed by the display apparatus, out of a plurality of possible operations corresponding to results of voice recognition performed based on the received voice command.

The determining the operation may include determining at least one operation by using the at least one from among the current usage status and the function currently performed by the display apparatus and voice recognition performed based on the voice command.

The determining the operation may include determining a service corresponding to the at least one from among the current usage status and the function currently performed by the display apparatus out of a plurality of services provided by the display apparatus; and determining the at least one operation corresponding to the determined service.

The determining the service may include determining what the current usage status is among a plurality of usage statuses, the user statuses including at least one from among channel selection, chat, menu selection and search request.

The determining the operation may include determining at least one operation based on a degree of similarity to the service corresponding to the at least one from among the current usage status and the function currently performed by the display apparatus, out of a plurality of operations corresponding to results of the performed voice recognition.

The performing the determined operation may include displaying a user selection window including a plurality of operations that corresponds to a result of voice recognition if a predetermined voice command is provided with respect to the performed operation.

The control method of a display apparatus may further include storing the received user's voice command and information related to the performed operation, and the performing the operation may include performing the operation based on the stored information related to the operation if the received voice command is same as the stored voice command.

The control method of a display apparatus may further include performing voice recognition with respect to the received voice command.

The control method of a display apparatus may further including requesting an external apparatus to perform voice recognition according to the received voice command; and receiving results of the performed voice recognition from the external apparatus.

According to an aspect of an exemplary embodiment, there is provided a voice recognition system including: a voice receiver which receives a command; and a controller which determines at least one from among a current usage status with respect to a display apparatus and a function currently performed by the display apparatus, determines an operation corresponding to the received voice command by using the at least one from among the determined current usage status and the function currently performed by the display apparatus, and performs the determined operation.

The controller may determine the operation corresponding to the at least one from among the current usage status and the function currently performed by the display apparatus, out of a plurality of operations corresponding to results of voice recognition performed according to the received voice command.

The controller may determine at least one operation by using the at least one from among the current usage status and the function currently performed by the display apparatus, and the voice recognition performed according to the voice command.

The controller may determine a service that corresponds to the at least one from among the current usage status and the function currently performed by the display apparatus, out of a plurality of services provided by the display apparatus, and determines the at least one operation corresponding to the determined service.

The controller may determine the corresponding service by determining what the current usage status is among a plurality of usage statuses, the plurality of usage statuses including at least one from among channel selection, chat, menu selection and search request.

The controller may determine the at least one operation based on a degree of similarity to a service corresponding to the at least one from among a current usage status and a function currently performed by the display apparatus, out of a plurality of operations corresponding to results of the performed voice recognition.

The voice recognition system may further include a display unit which displays an image thereon, and the controller may control the display unit to display a user selection window thereon, the window including a plurality of operations corresponding to results of voice recognition if a predetermined voice command is provided with respect to the performed operation.

The voice recognition system may further include a storage which stores therein the received voice command and information related to the performed operation corresponding to the voice command, and the controller may perform an operation based on the stored information related to the operation if the received voice command is a voice command stored in the storage.

According to an aspect of an exemplary embodiment, there is provided a voice recognition server including: a communicator which is connected to a display apparatus; and a controller which receives a voice command from the display apparatus, determines at least one operation corresponding to at least one from among a current usage status with respect to the display apparatus and a function currently performed by the display apparatus and the received voice command, and controls the communicator to transmit the determined at least one operation to the display apparatus.

The controller may determine the at least one operation corresponding to the at least one from among the current usage status with respect to the display apparatus and the function currently performed by the display apparatus, out of a plurality of operations corresponding to results of voice recognition performed according to the received voice command.

The controller may determine at least one operation by using the at least one from among the current usage status with respect to the display apparatus and the function currently performed by the display apparatus, and voice recognition performed according to the voice command.

The controller may determine a service that corresponds to the at least one from among the current usage status and the function currently performed by the display apparatus out of a plurality of services provided by the display apparatus, and determines the at least one operation corresponding to the determined service.

The controller may determine the corresponding service by determining what the current usage status is among a plurality of usage statuses, the plurality of usage statuses including at least one from among channel selection, chat, menu selection and search request.

The controller may determine the at least one operation based on a degree of similarity to a service corresponding to at least one from among the current usage status and the function that is currently performed by the display apparatus, out of a plurality of operations corresponding to results of performed voice recognition.

The voice recognition server may further include a storage which stores therein the received voice command and information related to the performed operation corresponding to the voice command, and the controller determines an operation based on the stored information if the received user's voice command is a voice command stored in the storage.

BRIEF DESCRIPTION OF THE DRAWINGS

The above and/or other aspects will become apparent and more readily appreciated from the following description of the exemplary embodiments, taken in conjunction with the accompanying drawings, in which:

FIG. **1** is a block diagram of a voice recognition system according to an exemplary embodiment;

FIGS. **2** and **3** are flowcharts showing a control method of a display apparatus according to an exemplary embodiment;

FIG. **4** illustrates a performance process of a voice recognition function by the voice recognition system through a user's speech according to an exemplary embodiment;

FIGS. **5** to **9** illustrate examples of operations of the voice recognition system according to an exemplary embodiment; and

FIG. **10** is a block diagram of a voice recognition server according to an exemplary embodiment.

DETAILED DESCRIPTION OF EXEMPLARY EMBODIMENTS

Below, exemplary embodiments will be described in detail with reference to accompanying drawings so as to be easily realized by a person having ordinary knowledge in the art. The exemplary embodiments may be embodied in various forms without being limited to the exemplary embodiments set forth herein. Descriptions of well-known parts are omitted for clarity, and like reference numerals refer to like elements throughout.

Hereinafter, features of respective elements of a voice recognition system according to an exemplary embodiment will be described in detail with reference to FIG. **1**. FIG. **1** is a block diagram of a voice recognition system according to an exemplary embodiment. As shown therein, a voice recognition system **1** may include a display apparatus **100** and a voice recognition server **300**, or may include only a display apparatus **100**.

The display apparatus **100** includes a signal receiver **110**, an image processor **120**, a voice receiver **130**, a controller **140**, and a display unit **150**, and may further include at least one of a voice recognition portion **135**, a communication portion **170** and a storage portion **160**. The display apparatus **100** may be implemented as, e.g., a TV, and may be connected to a voice recognition server **300** through the communication portion **170**.

The signal receiver **110** receives an image signal of at least one channel. The signal receiver **110** may be provided as various types depending on a standard of a received image signal and an implementation type of the display apparatus **100**. For example, the signal receiver **110** may be imple-

mented as a tuner to receive a radio frequency (RF) broadcasting signal from a broadcasting station. Otherwise, the signal receiver **110** may be connected to a peripheral imaging device such as a digital versatile disc (DVD) or a personal computer (PC) to receive an image signal therefrom.

The image processor **120** processes a received image signal according to preset image processing operations. The image processing operations of the image processor **120** includes, without limitation, decoding, de-interlacing, scaling, noise reduction, detail enhancement, etc. The image processor **120** may be implemented as a system-on-chip (SoC) which performs integrated functions of the aforementioned operations, or as an image processing board on which individual elements are installed to perform the aforementioned operations independently.

The display unit **150** displays an image thereon based on an image signal that is output by the image processor **120**. The display unit **150** may be implemented as various types including, without limitation, a plasma display panel (PDP), a liquid crystal display (LCD), an organic light emitting diodes (OLED) and a flexible display.

The voice receiver **130** receives a user's voice command. The voice receiver **130** receives a user's voice command as a single voice signal. Since the voice signal that is received by the voice receiver **130** may include various noises in addition to a user's voice which is subject to voice recognition, the voice receiver **130** may extract a user's voice from the received voice signal through a pre-processing operation, such as frequency analysis, and perform a voice recognition to the extracted voice.

The controller **140** determines at least one of a user's current usage status with respect to the display apparatus **100** and a function that is currently performed by the display apparatus **100**. For example, the user's current usage status and the function currently performed by the display apparatus **100** may include a TV channel watching status or Internet search, TV menu selection or content execution status. By using at least one of the user's current usage status and the function currently performed by the display apparatus **100** as determined by the controller **140**, the controller **140** determines an operation corresponding to a received voice command, and performs the determined operation.

Out of a plurality of operations corresponding to results of a voice recognition that has been performed according to a voice command received by the voice receiver **130**, the controller **140** may determine an operation corresponding to at least one of a user's current usage status and a function currently performed by the display apparatus **100** and may perform the determined operation. Examples of the operation corresponding to the results of the voice recognition may include a TV channel change, display of Internet search results, TV menu execution, and execution of contents such as movies, videos and music files.

The controller **140** may determine at least one function by using at least one of a user's current usage status and a function currently performed by the display apparatus **100**, and a voice recognition of a voice command.

More specifically, as shown in FIG. **4**, the controller **140** may determine a service that corresponds to at least one of a user's current usage status and a function currently performed by the display apparatus **100** out of a plurality of services that may be provided by the display apparatus **100**, and may determine at least one operation corresponding to the determined service. The plurality of services includes various services that may be provided by the display apparatus **100** such as provision of TV broadcasting channels, provision of contents such as movies, video and music files, Internet, home shopping, and interactive VOD service. The controller **140** may determine what a user's current usage status is among a plurality of usage statuses including at least one of channel selection, chat, menu selection and search request. For example, if a user is doing a video chat while watching TV news, a user's current usage status may be determined to be 'channel selection' or 'chat'. If a user's speech is 'I'm hungry' or 'order pizza', the user's current status may be determined to be 'chat' rather than 'channel selection' and an 'order service' may be determined to be a corresponding service based on the user's speech.

The controller **140** may determine at least one operation based on a degree of similarity to a service corresponding to at least one of a user's current usage status and a function currently performed by the display apparatus **100**, out of a plurality of operations corresponding to results of a voice recognition performed. In an exemplary embodiment, if a service corresponding to a user's current usage status is 'provision of broadcasting channel', an 'execution of TV broadcasting' which is most similar to the 'provision of broadcasting channel' service may be determined to be a corresponding operation out of a plurality of operations, such as 'execution of TV broadcasting', 'execution of cable broadcasting' and 'execution of VOD on the Internet', which are related services.

Information related to classification of a user's voice command and a user's current usage status, classification of service corresponding to a current usage status and classification of operations corresponding to services may be stored as corresponding data in the storage portion **160** for management.

If a user gives a predetermined voice command for an operation performed, the controller **140** may control the display unit **150** to display thereon a user selection window (not shown) for a plurality of operations corresponding to results of a voice recognition. That is, if an operation performed according to a user's voice command is not an operation desired by a user, a user may give a predetermined voice command such as 'cancel' or 'another screen', and accordingly the display unit **150** may display thereon a user selection window showing a predetermined number of operations corresponding to results of voice recognition in the order or priority based on the degree of similarity for a user to select an operation.

In another exemplary embodiment, the display apparatus **100** may further include a storage portion **160** to store therein information related to a user's received voice command and information of the operation performed according to the voice command. In such case, if a received user's voice command is a voice command that is stored in the storage portion **160**, the controller **140** may perform an operation based on the information related to the stored operation. For example, if the operation of 'execution of SBS news channel' has been performed according to a user's voice command such as 'SBS' in the past and related information has been stored in the storage portion **160** and if a user's voice command of 'SBS' is received again thereafter, the display apparatus **100** may forgo the determination process of an operation that corresponds to results of voice recognition, and may receive operation information corresponding to the voice command 'SBS' from the storage portion **160**, and may perform the operation.

The display apparatus **100** may further include a voice recognition portion **135** to perform a voice recognition with respect to a voice command received by the voice receiver **130**. The voice recognition portion **135** performs a voice

recognition with respect to a voice command that is received by the voice receiver **130**. The voice recognition portion **135** may be implemented as an embedded engine that is provided in the display apparatus **100**, or as an additional voice recognition server **300** according to another exemplary embodiment, or as a single processor including the controller **140**.

The voice recognition portion **135** may recognize a particular word that is set for a user's voice input that is given to control the display apparatus **100**. For example, if a user inputs a voice signal such as 'channel up', 'power off' or 'mute', the voice recognition portion **135** may recognize the voice signal and if the voice signal is recognized as one of preset languages included in a stored language list, may output the recognized language data. The embedded engine may be implemented by a memory with a small capacity, and may provide superior speed.

In another exemplary embodiment, the display apparatus **100** may be connected to a voice recognition server **300** to perform a voice recognition with respect to a voice command that is received by the voice receiver **130**. If the voice recognition portion **135** is provided as the voice recognition server **300**, the display apparatus **100** may transmit a voice signal corresponding to the voice command received by the voice receiver **130**, to the voice recognition server **300** through the communication portion **170**, and may receive results of voice recognition from the voice recognition server **300**. Unlike the case where the voice recognition portion **135** is implemented as an embedded engine, the voice recognition server **300** may recognize various words or consecutive words. For example, inputting a particular search word in a search window or inputting a sentence through an application such as social networking service (SNS) requires recognition of many words, and thus it is not easy to recognize such words through the embedded engine. But such recognition may be performed through the voice recognition server **300**.

In another exemplary embodiment, the voice recognition portion **135** may be implemented as a single processor included in the controller **140**. In such case, the voice recognition portion **135** may be included in the controller **140** rather than being an additional component of the display apparatus.

Hereinafter, features of a control method of the display apparatus **100** according to the exemplary embodiment will be described in detail with reference to FIGS. **2** and **3**, and FIGS. **4** to **9** as necessary. FIG. **2** is a flowchart showing a control method of the display apparatus **100** according to an exemplary embodiment. As shown therein, the display apparatus **100** receives a user's voice command (S**110**). The controller **140** determines at least one of a user's current usage status with respect to the display apparatus **100** and a function currently performed by the display apparatus **100** (S**130**). The controller **140** determines the operation that corresponds to the received voice command by using at least one of the determined user's current usage status and the function currently performed by the display apparatus **100** (S**140**), and performs the determined operation (S**150**).

The operation S**140** may include determining an operation that corresponds to at least one of the user's current usage status and the function currently performed by the display apparatus **100** out of a plurality of operations corresponding to results of voice recognition performed according to the received voice command. The voice recognition performed according to the received voice command in connection with the operation S**140** may be performed before the operation S**130** of determining at least one of the user's current usage status with respect to the display apparatus **100** and the function currently performed by the display apparatus **100**, or may be performed after the operation S**130**. The operation S**140** may include determining at least one operation by using at least one of the user's current usage status and the function currently performed by the display apparatus **100**, and voice recognition performed according to the voice command.

As a detailed example, as shown in FIG. **5**, if a user speaks 'MBC' while watching KBS news channel, the display apparatus **100** determines that the user's current usage status is 'watching news channel' and may display the MBC news channel as an operation corresponding to results of voice recognition with respect to the user's speech of 'MBC'. As another example, as shown in FIG. **6**, if a user speaks 'MBC' while using the Internet, the display apparatus **100** may determine that the user's current usage status is 'Internet search' and may display MBC website as an operation corresponding to results of voice recognition performed according to the user's speech of 'MBC'. In an example in FIG. **7**, if a user speaks 'Haewoondae' while watching a movie, the display apparatus **100** may determine that the user's current usage status is 'execution of content' and execute a movie titled 'Haewoondae' as an operation corresponding to the results of voice recognition performed according to the user's speech of 'Haewoondae'. In an example in FIG. **8**, if a user speaks 'Haewoondae' while using the Internet, the display apparatus **100** may determine that the user's current usage status is 'Internet search' and may display Haewoondae culture and tourism website as an operation corresponding to results of voice recognition performed according to the user's speech of 'Haewoondae'.

As another example, as shown in FIG. **9**, if a user speaks 'reservation' while selecting a menu of the display apparatus **100**, the display apparatus **100** may determine that the user's current usage status is 'menu selection' and may automatically execute a reservation menu as an operation corresponding to results of voice recognition performed according to the user's speech of 'reservation'.

FIG. **3** is a flowchart showing a more detailed control method of the display apparatus that has been explained in FIG. **2**. As shown therein, the display apparatus **100** receives a user's voice command (S**110**), and the controller **140** determines at least one of the user's current usage status with respect to the display apparatus **100** and the function currently performed by the display apparatus **100** (S**130**). The controller **140** determines a service corresponding to at least one of the user's current usage status and the function currently performed by the display apparatus **100**, out of the plurality of services that may be provided by the display apparatus **100** (S**143**). The operation S**143** may include determining a corresponding service by determining what the user's current usage status is among the plurality of usage statuses including at least one of channel selection, chat, menu selection, and search request. The controller **140** determines at least one operation corresponding to the determined service out of the plurality of operations corresponding to the results of voice recognition performed according to the received voice command (S**145**). The operation S**145** may include determining at least one operation based on the degree of similarity to the service corresponding to at least one of the user's current usage status and the function currently performed by the display apparatus **100**. The voice recognition performed according to the received voice command in connection with the operation S**145** may be performed before the operation S**130** of determining at least one of the user's current usage status

with respect to the display apparatus **100** and the function currently performed by the display apparatus **100**, or may be performed after the operation S**130**. Lastly, the controller **140** performs the determined operation (S**150**). The operation S**150** may include displaying a user selection window for a plurality of operations corresponding to results of voice recognition if a user gives a predetermined voice command with respect to the performed operation.

The control operation of the display apparatus **100** may further include an operation of storing information of the received user's voice command and the operation performed according to the voice command. In such case, the operation S**150** of performing the determined operation may include performing the operation based on the information of the stored operation if the received user's voice command is the stored voice command.

Hereinafter, features of respective elements of the voice recognition server **300** according to an exemplary embodiment will be described in detail with reference to FIG. **10**. FIG. **10** is a block diagram of the voice recognition server **300** according to an exemplary embodiment. The voice recognition server **300** includes a controller **340** and a communication portion **370**, and may be connected to the display apparatus **100** to be implemented as a voice recognition system **1**. In another exemplary embodiment, the voice recognition server **300** may further include a voice recognition portion **335** or a storage portion **360**. The communication portion **370** of the voice recognition server **300** communicates with the display apparatus **100**. The controller **340** receives a user's voice command from the display apparatus **100**, and determines an operation corresponding to at least one of a user's current usage status with respect to the display apparatus **100** and a function currently performed by the display apparatus **100** and the received voice command. The controller **340** controls the communication portion **370** to transmit the determined operation to the display apparatus **100**.

The controller **340** may determine an operation corresponding to at least one of the user's current usage status with respect to the display apparatus and the function currently performed by the display apparatus **100**, out of a plurality of operations corresponding to results of voice recognition performed according to the received voice command. The controller **340** may determine the at least one operation by using at least one of the user's current usage status with respect to the display apparatus **100** and the function currently performed by the display apparatus **100**, and the voice recognition performed according to the voice command.

The controller **340** may determine a service that corresponds to at least one of the user's current usage status with respect to the display apparatus **100** and the function currently performed by the display apparatus **100** out of a plurality of services that may be provided by the display apparatus **100**, and may determine at least one operation corresponding to the determined service. The controller **340** may determine the corresponding service by determining what the user's current usage status with respect to the display apparatus **100** is among the channel selection, chat, menu selection and search request. The controller **340** may determine the at least one operation based on the degree of similarity to the service corresponding to at least one of the user's current usage status with respect to the display apparatus **100** and the function currently performed by the display apparatus **100**, out of the plurality of operations corresponding to results of voice recognition performed to the received voice command.

The voice recognition server **300** may further include a storage portion **360** to store therein information of the received user's voice command and the determined operation corresponding to the voice command. If the received user's voice command is the same as a voice command that is stored in the storage portion **360**, the controller **340** may determine the operation based on the corresponding stored information. The voice recognition server **300** may further include a voice recognition portion **335** to perform voice recognition with respect to a received voice command. In an exemplary embodiment, in the voice recognition system **1**, the voice recognition portion **335** of the voice recognition server **300** may perform voice recognition according to the user's voice command provided by the display apparatus **100**. In another exemplary embodiment, the voice recognition system **1** may be implemented so that the display apparatus **100** may perform voice recognition according to a part of the received user's voice command, and the voice recognition portion **335** of the voice recognition server **300** may perform voice recognition according to the other part of the received user's voice command.

As described above, a voice recognition system, a voice recognition server and a control method of a display apparatus may ensure reliability and convenience in performing a voice recognition function as intended by a user based on analysis of a user's current usage status with respect to the display apparatus.

Although a few exemplary embodiments have been shown and described, it will be appreciated by those skilled in the art that changes may be made in these exemplary embodiments without departing from the principles and spirit of the invention, the range of which is defined in the appended claims and their equivalents.

What is claimed is:

1. A display apparatus comprising:

an interface circuitry;

a display; and

a processor configured to:

receive a voice input through the interface circuitry,

identify a service which is currently displayed on the display,

if the identified service is watching a television (TV) channel, change the TV channel to a channel corresponding to the received voice input,

if the identified service is searching through an Internet, display a search result of the received voice input,

if the identified service is selecting a TV menu, execute a TV menu corresponding to the received voice input, and

if the identified service is executing a content, execute a content corresponding to the received voice input.

2. The display apparatus according to claim **1**, wherein the processor is configured to:

identify an operation among a plurality of different operations for the received voice input based on a degree of similarity of a service with each of the plurality of different operations, the service corresponding to the identified service,

wherein the plurality of different operations comprise changing the TV channel to the channel corresponding to the received voice input, displaying the search result of the received voice input, executing the TV menu corresponding to the received voice input and executing the content corresponding to the received voice input.

3. The display apparatus according to claim **1**, wherein the processor is configured to:

control the display to display an user interface (UI) comprising a first menu item corresponding to an operation among a plurality of different operations for the received voice input, and

based on a user input for the displayed first menu item, perform the operation,

wherein the plurality of different operations comprise changing the TV channel to the channel corresponding to the received voice input, displaying the search result of the received voice input, executing the TV menu corresponding to the received voice input and executing the content corresponding to the received voice input.

4. The display apparatus according to claim **3**, wherein the processor is configured to control the display to display the UI comprising a second menu item for stopping the performed operation.

5. The display apparatus according to claim **1**, further comprising a storage, wherein the processor is configured to:

control the storage to store information on an operation among a plurality of different operations for the received voice input, and

based on receiving a second voice input which is same as the received voice input, perform the operation based on the stored information, and

wherein the plurality of different operations comprise changing the TV channel to the channel corresponding to the received voice input, displaying the search result of the received voice input, executing the TV menu corresponding to the received voice input and executing the content corresponding to the received voice input.

6. The display apparatus according to claim **1**, wherein a first operation corresponding to a first service is different from a second operation corresponding to a second service which is different from the first service.

7. A control method of a display apparatus, the control method comprising:

receiving a voice input,

identifying a service which is currently displayed on a display,

if the identified service is watching a television (TV) channel, changing the TV channel to a channel corresponding to the received voice input,

if the identified service is searching through an Internet, displaying a search result of the received voice input,

if the identified service is selecting a TV menu, executing a TV menu corresponding to the received voice input, and

if the identified service is executing a content, executing a content corresponding to the received voice input.

8. The control method according to claim **7**,

further comprising identifying an operation among a plurality of different operations for the received voice input based on a degree of similarity of a service with each of the plurality of different operations, the service corresponding to the identified service,

wherein the plurality of different operations comprise changing the TV channel to the channel corresponding to the received voice input, displaying the search result of the received voice input, executing the TV menu corresponding to the received voice input and executing the content corresponding to the received voice input.

9. The control method according to claim **7**, further comprising displaying an user interface (UI) comprising a first menu item corresponding to an operation among a plurality of different operations for the received voice input, and

based on a user input for the displayed first menu item, performing the operation,

wherein the plurality of different operations comprise changing the TV channel to the channel corresponding to the received voice input, displaying the search result of the received voice input, executing the TV menu corresponding to the received voice input and executing the content corresponding to the received voice input.

10. The control method according to claim **9**, wherein the displaying the UI comprises displaying the UI comprising a second menu item for stopping the performed operation.

11. The control method according to claim **7**, further comprising storing information on an operation among a plurality of different operations for the received voice input, and

based on receiving a second voice input which is same as the received voice input, performing the operation based on the stored information,

wherein the plurality of different operations comprise changing the TV channel to the channel corresponding to the received voice input, displaying the search result of the received voice input, executing the TV menu corresponding to the received voice input and executing the content corresponding to the received voice input.

12. The control method according to claim **7**, wherein a first operation corresponding to a first service is different from a second operation corresponding to a second service which is different from the first service.

13. The display apparatus according to claim **1**, wherein the processor is configured to:

based on identifying at least two services among a plurality of services, identify the service corresponding to the received voice input from among the at least two services, and

identify an operation corresponding to the identified service.

* * * * *